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# NASA Policy Directive

**NPD 7120.4D**

Effective Date: March 16, 2010

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2015**COMPLIANCE IS MANDATORY**[Printable Format \(PDF\)](#)

Request Notification of Change

(NASA Only)

## **Subject: NASA Engineering and Program/Project Management Policy**

**Responsible Office: Office of the Chief Engineer**

### **1. POLICY**

a. This document provides the statement of policy and responsibilities for all of the management and engineering disciplines under the purview of the Office of the Chief Engineer, including NASA Procedural Requirements covering management of Space Flight, Research and Technology, Information Technology, and Institutional Infrastructure programs and projects; Systems Engineering; Software Engineering; Technical Standards; Lessons Learned; Product Data Management/Product Lifecycle Management (PDM/PLM); and the use of the Metric System. Additionally, this document consolidates the Agency's crosscutting software policy and responsibilities across NASA Headquarters' offices and mission directorates.

b. Acquisition. All programs, projects, and activities are required to budget in accordance with cost and schedule analysis as directed in NPD 1000.5, Policy for NASA Acquisition. It is NASA policy to manage acquisition from the beginning of an initiative to the completion and final disposition of an accepted program, project, or activity to accomplish mission objectives; deliver projects and products on time and within allocated budget resources; and meet programmatic, institutional, and technical commitments.

(1) Strategic Acquisition Meetings. It is NASA policy to ensure that the acquisition planning process considers and reflects Agency-level strategic objectives, commensurate with projected resources, and is compliant with all applicable regulations through Acquisition Strategy Planning meetings, Acquisition Strategy Meetings, and Procurement Strategy Meetings outlined in NPD 1000.5, Policy for NASA Acquisition in coordination with the governing NPR 7120.5, NPR 7120.7, or NPR 7120.8.

c. Program/Project Management. It is NASA policy to apply program and project management procedural requirements, including risk management procedural requirements identified in NPR 8000.4, to plan, track progress, and accomplish mission

objectives. Programs and projects are managed in the logical progression of four processes: formulation, approval, implementation, and evaluation. All programs and projects follow the procedural requirements and life-cycle reviews unique to their investment area as defined by the following documents:

(1) NPR 7120.5 applies to all NASA flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). This NPR also applies to reimbursable space flight programs/projects performed for non-NASA sponsors.

(2) NPR 7120.7 applies to all NASA Information Technology and Institutional Infrastructure programs and projects (excluding those managed under NPR 7120.5) to include the development of information technology capabilities, real property (construction of facilities and environmental compliance and restoration), and other mission support investments.

(3) NPR 7120.8 applies to all current and future Research & Technology (R&T) managed or funded by NASA (excluding R&T managed under NPR 7120.5, NPR 7120.7, and investments funded with Center discretionary funds within Center Management and Operations). R&T programs and projects are managed using NPR 7120.5 in lieu of this NPR when: 1) the R&T is directly funded by a space flight program/project; and 2) the space flight mission's success and schedule are directly tied to the success of the R&T.

d. Product Data Management (PDM) and Product Life Cycle Management (PLM). It is NASA policy to apply disciplined, collaborative processes and systems to identify, acquire, and control product data throughout the project life cycle for Space Flight programs and projects as defined by NPR 7120.5.

e. Systems Engineering. It is NASA policy to apply the systems engineering processes across the life cycle of products and components. Systems engineering is a methodical, disciplined approach for the design, realization, technical management, operations, and retirement of a system. NASA's procedural requirements for systems engineering are found in NPR 7123.1 and apply to all programs, projects, and activities.

(1) Requirements Management. It is NASA policy to establish clear, concise, verifiable, and valid requirements for processes, products, and components. It is NASA policy to track and implement requirements using requirements management and configuration management control processes. Changes to requirements are documented and submitted to established program/project change request systems. Approved relief from complying with a requirement includes documenting it as either a deviation or a waiver.

f. Software. For all software created, acquired, or maintained by or for NASA, including commercial off-the-shelf software (COTS), Government off-the-shelf software (GOTS), modified off-the-shelf software (MOTS), open source, embedded, reuse, legacy, and heritage software:

(1) It is NASA policy to utilize a disciplined software engineering approach to acquire, develop, assure, maintain, operate, and manage software in support of all NASA's missions, programs, and projects. Policy and procedural requirements for software are documented in this NPD, NPR 7150.2, and NPR 2210.1.

(2) It is NASA policy to use the NASA Independent Verification and Validation (IV&V) Facility as the sole provider of IV&V services when software created by or for NASA is selected for IV&V by the NASA Chief, Safety and Mission Assurance.

(3) It is NASA policy to report, inventory, manage, and protect software created by or for NASA as valuable intellectual property during all phases of the life cycle. It is NASA policy to assert intellectual property rights for software, where deemed appropriate, in order to facilitate its transfer and reuse by commercial, industrial, educational, and Government organizations.

(4) It is NASA policy to establish uniform procedures concerning the release of software created by or for NASA that will maximize its benefit to NASA, the U.S. public, and the U.S. economy and release software consistent with law and applicable agreements for commercial, industrial, educational, and Governmental purposes. Policy and procedural requirements for the release of NASA software are documented in this NPD and NPR 2210.1, respectively.

(5) It is NASA policy to comply with copyright laws protecting computing software and with the provisions of Executive Order 13103, Computer Software Piracy.

g. Safety Engineering. It is NASA policy to design, develop, manage, and operate NASA's vehicles, systems, and assets in a manner which protects the public, astronauts, pilots, NASA workforce, planetary and space environments, high-value equipment, and property from harm.

h. Technical Standards.

(1) It is NASA policy to use established, consensus-based technical standards, as defined in OMB Circular A-119, to provide an effective basis for defining requirements, evaluating implementation approaches, assessing resulting performance, and ensuring quality throughout the life cycle.

(2) It is NASA policy to establish and maintain NASA Technical Standards, as required in areas where established voluntary consensus standards (VCS) available from other sources fail to meet NASA's technical needs.

(3) It is NASA policy to encourage commonality in the use of technical standards across NASA programs and projects, and in appropriate instances, mandate the use of specific technical standards to promote consistency in practice, reduce costs, ensure robust interfaces, and improve interoperability.

(4) It is NASA policy to participate in the development of VCS when such participation is in the public interest and is compatible with NASA's missions, authorities, priorities, and budget resources.

i. Metric System of Measurement. It is NASA policy for all new programs and projects subject to NPR 7120.5 to use the International System of Units (commonly known as the Systeme Internationale (SI) or metric system of measurement) for design, development, and operations; in preference to customary U.S. measurement units, for all internal activities, related NASA procurements, grants, and business activities. Exceptions to this policy may be granted by the NASA Chief Engineer based on program/project recommendations by the responsible Mission Directorate Associate Administrator.

j. Technical Assessments and Analysis. It is NASA policy to resolve high-risk technical

issues through in-depth assessments, testing, and analysis. The Agency has established the NASA Engineering and Safety Center (NESC) to perform independent technical assessments and analyses on a needs and available resources basis.

k. Checks and Balances. It is NASA policy to utilize checks and balances that assures compliance with NASA directives, procedural requirements, and applicable standards. Checks and balances include, but are not limited to the following:

(1) Technical Authority. In support of NASA's checks and balances system, NASA's Technical Authorities are members of key review and control boards and approves/disapproves waivers and deviations to requirements under their authority. The Agency has established three Technical Authority governance chains: Engineering, Safety and Mission Assurance, and Health and Medical.

(2) Dissenting Opinions. Dissenting opinions are respected throughout the Agency and are properly dispositioned according to a common process without fear of retribution. The dissenting person or organization is free to elevate a dissenting opinion successively up the chain of authority(s) until satisfied with the disposition or until finally resolved by the NASA Administrator.

(3) Independent Reviews. Conduct independent programmatic and technical reviews covering scope, cost, schedule, risks, or functional acceptability. "Independence" in this context requires reviewers who are not under the supervision, direction, advocacy, or control of the project.

(4) Compliance Assessments. Conduct periodic assessments within the Agency and its contractor community to check compliance against requirements (i.e., engineering and program/project management policies, procedural requirements, and invoked standards) to assure requirements are implemented when conducting NASA funded work.

l. Training. It is NASA policy to hold NASA leaders, managers, supervisors, and employees accountable for ongoing training and skills enhancement in the disciplines of program/project management and engineering.

m. Lessons Learned. It is NASA policy to collect, validate, assess, codify, and disseminate lessons learned to continually improve the disciplines of program/project management and engineering, as well as preventing the reoccurrence of known problems. It is NASA policy to ensure lessons learned are incorporated into directives, procedural requirements, standards, handbooks, guides, or rules. NASA's procedural requirements for lessons learned across all of the Agency's investment areas are found in NPR 7120.6.

n. Knowledge Sharing. It is NASA policy to effectively manage the Agency's knowledge resources to identify, capture, and sustain knowledge and information across missions and generations.

## **2. APPLICABILITY**

a. This NPD is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the Jet Propulsion Laboratory, other contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.

### 3. AUTHORITY

- a. 42 U.S.C. 2473(c)(1), Section 203(c)(1) of the National Aeronautics and Space Act of 1958, as amended.
- b. 15 U.S.C. §205b, Section 3 of the Metric Conversion Act of 1975, Public Law 94-168, as amended by the Omnibus Trade and Competitiveness Act of 1988, Public Law 100-418.
- c. Executive Order 12770, Metric Use in Federal Government Programs, dated July 25, 1991.
- d. 44 U.S.C. §3501, et seq., Paperwork Reduction Act of 1995 (Public Law 104-13), as amended.
- e. 40 U.S.C. §§11101, et seq., Information Technology Management, Public Law 107-217, repealing and reenacting the Clinger Cohen Act of 1996, as amended.
- f. 35 U.S.C. §200, et seq., Patent Rights in Inventions Made With Federal Assistance.
- g. 22 U.S.C. §2751, et seq., Arms Export Control Act, as implemented by the International Traffic in Arms Regulations, 22 CFR Part 120-30.
- h. 50 U.S.C. Appendix §§2401-2420, Export Administration Act of 1979, as implemented by the Export Administration Regulations, 15 CFR Part 730-774.
- i. 29 U.S.C. §§794d, the Rehabilitation Act Amendment of 1998.
- j. 36 CFR Part 1194, Electronic and Information Technology Accessibility Standards.
- k. OMB Circular A-130, Management of Federal Information Resources.
- l. Executive Order 12770, Metric Usage in Federal Government Programs.
- m. Executive Order 13103, Computer Software Piracy.

### 4. APPLICABLE DOCUMENTS

- a. NPD 1000.0, NASA Governance and Strategic Management Handbook.
- b. NPD 1000.3, The NASA Organization.
- c. NPD 1000.5, Policy for NASA Acquisition.
- d. NPR 2210.1, External Release of NASA Software.
- e. NPD 2800.1, Managing Information Technology.
- f. NPR 2800.1, Managing Information Technology.
- g. NPR 7120.5, NASA Space Flight Program and Project Management Requirements.
- h. NPR 7120.6, NASA Lessons Learned Process.
- i. NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.
- j. NPR 7120.8, NASA Research and Technology Program and Project Management



## Requirements.

- k. NPR 7123.1, NASA Systems Engineering Processes and Requirements.
- l. NPR 7150.2, NASA Software Engineering Requirements.
- m. NPR 8000.4, Agency Risk Management Procedural Requirements.
- n. NPD 8700.1, NASA Policy for Safety and Mission Success.
- o. NASA-STD-8719.13, NASA Software Safety Standard.
- p. OMB Circular A-119.

## 5. RESPONSIBILITY

a. The NASA Chief Engineer, NASA Chief Information Officer (CIO), NASA Chief, Safety and Mission Assurance, Chief Health and Medical Officer, Associate Administrators for Mission Directorates, and Center Directors are responsible for promoting policies, standards, best practices, and guidance in their areas of responsibility under this NPD. They shall coordinate efforts to maximize the commonality, clarity, and effectiveness of direction and guidance.

b. The NASA Chief Engineer shall:

- (1) Lead Agency-wide initiatives to advance capabilities in engineering and program/project management.
- (2) Establish Agency-wide policies, procedural requirements, standards, lessons learned, and best practices.
- (3) Assess and monitor the Agency's capabilities in engineering and program/project management.
- (4) Establish boards (e.g., NASA Engineering Management Board) and teams to address engineering and program/project management issues.
- (5) Maintain the official list of program, projects, and activities subject to this NPD and its related NPRs.
- (6) Advise the Administrator and senior officials on matters pertaining to engineering and program/project management.
- (7) Ensure use of best practices in selection and application of technical standards to NASA programs and projects.
- (8) Develop NASA's technical workforce (in the areas of engineering and program/project management) through a competency-based training model that identifies learning experiences and activities.
- (9) Facilitate the dissemination and promote utilization and implementation of lessons learned and best practices.
- (10) Serve as the Metric Executive for NASA to meet the external requirements of 15 U.S.C. §205b and Executive Order 12770.
- (11) Maintain periodic oversight of compliance with the Office of the Chief Engineer's

policy, procedural requirements, and standards throughout the Agency and its contractor community.

(12) Collect and analyze measurement data from compliance assessments to monitor and control the use of policies, procedural requirements, and standards.

(13) Conduct knowledge sharing activities, including relevant online resources, forums, and publications.

(14) Provide leadership in PDM/PLM by establishing requirements related to product definition, engineering data handling and control, and management of configurations for compatibility across NASA in support of NASA programs and projects.

(15) Integrate NASA software management, acquisition, engineering, and assurance requirements into policies, directives, and standards applicable to NASA's systems engineering, and program and project management processes.

(16) Document NASA guidance and best practices to support NASA's systems engineering and program and project management processes.

(17) Establish and manage the Agency's software classification definitions and maintain the Software Inventory.

(18) Through the Engineering Management Board, charter working groups to oversee the implementation and update of an Agency-wide plan to work toward continuous, sustained software engineering process and product improvements, and to ensure appropriate visibility of software issues within the Agency.

(19) Chair the Software Steering Board to strengthen Agency-wide coordination and communication of crosscutting software investments, resolve issues, respond to significant external surveys/audits/reviews, and facilitate the establishment of policies affecting the Agency.

(20) Be responsible for the establishment and enforcement of policies and procedural requirements in this directive.

(21) Approve/disapprove waivers and deviations to requirements under their Authority.

(22) Oversee the functional management of NESC and assures the performance of NESC's services and activities.

c. In addition to the responsibilities assigned within other Agency Directives (NPD 1000.3, NPD 8700.1, and other Safety and Mission Assurance NPDs and NPRs) the NASA Chief, Safety and Mission Assurance shall:

(1) Assure the safety, quality, and reliability of NASA software.

(2) Review project software processes and make recommendations to programs/projects, governing Program Management Councils, Mission Directorates, governing Information Technology (IT) Program/Project Management Boards, and independent Technical Authorities.

(3) Conduct oversight of NASA's software assurance programs.

(4) Independently assess project software management, engineering, and assurance practices.

- (5) Oversee the functional management of the NASA IV&V Program and assure the performance of all software IV&V processes, services, and activities.
- (6) Establish and manage processes for the selection of software to which to apply IV&V.
- (7) Charter the IV&V Board of Advisors which makes prioritized recommendations for allocating IV&V services to projects based on the annual Software Inventory (maintained by the Chief Engineer) and the Office of Safety and Mission Assurance defined process.
- (8) Select and maintain the list of software projects to which IV&V is to be applied.
- (9) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and engineering issues.
- (10) Support PDM/PLM by establishing requirements related to the handling and control of Safety and Mission Assurance data such as Problem Reporting and Corrective Action data, Failure Modes and Effects Analysis/Critical Item List, Hazard Analyses, and risk scenario models by means of disciplined, collaborative processes and systems and the interfacing and integration of that data with PDM/PLM engineering data and systems.
- (11) Establish Agency-wide standards and lessons learned relative to safety and mission assurance.
- (12) Approve/disapprove waivers and deviations to requirements under their authority.

d. In addition to the responsibilities assigned within other Agency Directives (NPD 1000.3 and other Health and Medical NPDs and NPRs), the NASA Chief Health and Medical Officer shall:

- (1) Serve as the Agency Health and Medical Technical Authority (HMTA) and approve/disapprove waivers and deviations to requirements under their authority.
- (2) Assure Agency policy, direction, and procedural requirements are flowed down into Center HMTA implementation plans.
- (3) Develop and maintain Agency-wide health and medical technical standards applicable to programs and projects.
- (4) When applicable, approve program's and project's approaches to HMTA based on Center's HMTA infrastructure.

e. The NASA Chief Information Officer shall carry out responsibilities as described in NPD 1000.3, NPD 2800.1, NPR 2800.1, and has the authorities as described in NPD 1000.0. In addition to responsibilities described in other Agency Directives:

- (1) Serve as the senior advisor to the Administrator on all Agency Information Technology requirements.
- (2) Identify the sourcing strategy for centrally provisioned services such as network, desktop, Web, and data center.

f. Mission Directorate Associate Administrators shall:

- (1) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and



engineering issues.

- (2) Execute the NPRs and related policy documents governed by this NPD.
- (3) Support and provide information for assessments conducted by the Office of the Chief Engineer, Office of Safety and Mission Assurance, and Office of Chief Health and Medical Officer.
- (4) Classify their respective work efforts in accordance with NPRs, applicable standards, and local Center directives to identify applicable legal, institutional, and technical requirements.
- (5) Ensure corrective actions resulting from non-compliances are identified, implemented, and tracked to closure.
- (6) Ensure their program and project portfolios comply with NPD 1000.5.
- (7) Ensure PDM/PLM requirements are identified and implemented for NASA programs and projects, to include contractors, responsible for generation of authoritative data to ensure collaboration with adequate work flow control, configuration management, secure access, and PDM/PLM data integration.
- (8) Ensure data delivery, usage, and access rights are considered early during project development for the entire project life cycle.

g. The Director of the Innovative Partnership Program (IPP) is responsible for the overall management of the NASA software release program under NPR 2210.1 and shall establish and implement software release procedures, requirements, and supplemental policy in cooperation with the General Counsel or designee. The Director of IPP charts a Software Release Authority Working Group (SRAWG) to oversee the software release process. The SRAWG will coordinate with the Software Working Group (SWG) to ensure appropriate visibility of software issues within the Agency. Additional responsibilities for the NASA software release program are provided in NPR 2210.1.

h. Center Directors shall:

- (1) Locally align management and engineering practices to support Agency needs.
- (2) Execute the NPRs and related policy documents governed by this NPD.
- (3) Support and provide information for assessments conducted by the Office of the Chief Engineer.
- (4) Ensure corrective actions resulting from non-compliances are identified, implemented, and tracked to closure.
- (5) Be responsible for the Center's improvement activities, as defined in the Center improvement plans and training plans.
- (6) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and engineering issues.
- (7) Appoint and support an individual as the Center's Software Release Authority (SRA). The Center Director may appoint a group of individuals as the Software Release Group to be chaired by the Center SRA in accordance with NPR 2210.1. The SRA shall be the Center representative on the SRAWG. The Chairperson of the SRAWG shall be a

member of the SWG.

(8) Provide the Chief Engineer with information to support the creation of the Software Inventory.

(9) Ensure resources, capabilities, and infrastructure identified by programs and projects are available to support PDM/PLM execution.

(10) Serve as (or delegate) the Center Engineering Technical Authority role and responsibilities.

(11) Approve/disapprove waivers and deviations to requirements under their authority.

i. The Chief Financial Officer shall:

(1) Provide leadership for the planning, analysis, justification, control, and reporting of all Agency fiscal resources.

(2) Oversee all financial management activities relating to the programs and operations of the Agency.

(3) Lead the budgeting and execution phases of the planning, programming, budgeting, and execution process.

(4) Monitor and report the financial execution of the Agency budget.

(5) Maintain and update the Agency's official list of programs and projects work breakdown structure used in the financial and budgeting system.

j. Managers and engineers responsible for the realization of a program, project, service, or activity shall:

(1) Classify their work efforts in accordance with NPRs, mandatory standards, and local Center directives to identify applicable legal, institutional, and technical requirements (e.g., software is classified consistent with its use (NPR 7150.2) and safety (NASA-STD-8719.13)).

(2) Require providers (including internal NASA providers) to have proven organizational capabilities and experience to deliver quality products on time, within budget, and within technical acceptability.

(3) Require providers to develop a plan to manage product development, operation, and maintenance throughout the program/project life cycle. This plan shall include the collection and reporting of actual expenditures at the project level by life-cycle phases.

(4) Include NASA assurance practitioners in acquisition, review, verification, maintenance, and certification processes.

(5) Ensure providers allow access to products and associated artifacts to enable insight/oversight by engineering and assurance personnel (which includes the NASA IV&V Facility and NASA Safety Center).

(6) Execute NASA's life-cycle requirements for programs, projects, systems, and software.

(7) Collect, document, and submit program/project and engineering lessons learned in accordance with NPR 7120.6.

(8) Support and provide information for assessments of Centers' and contractors' capabilities and compliance with engineering and program/project management requirements and standards.

(9) If subject to NPR 7120.5, identify method for implementing the SI system of measurement prior to completion of the Systems Requirements Review or equivalent milestone during new Program/Project Formulation. Document approved deviations and waivers.

(10) Document determinations on where and how the SI system of measurement is to be used in the Program or Project Plan, including use of SI units in related mission support and institutional projects.

(11) Ensure that PDM/PLM processes are in place to support the program and project life cycle that establish the product architecture with appropriate taxonomy and ontology identifying authoritative data and sources, available in a secure, readily accessible manner.

(12) Ensure the minimum, essential contractor-originated data is identified and acquired with sufficient access and usage rights to support the full project life cycle. Each Project Manager should define contract data deliverables and coordinate data requirements of other functional specialties, e.g., safety, reliability, quality, logistics, test and verification, to minimize data acquisition redundancies and inconsistencies.

k. The IV&V Program Manager shall:

(1) Establish and manage the Agency's software IV&V services and procedures.

(2) Establish, maintain, and report on the results of IV&V services and findings.

(3) Support NASA's program for improving software assurance and other trusted verifications (e.g., independent assessments, peer reviews, and research).

(4) Determine and document the services provided by the NASA IV&V Facility on projects selected for IV&V by the NASA Chief, Safety and Mission Assurance.

l. The governing IT Program/Project Management Boards shall review program and project software processes and products including, but not limited to, evidence of conformance to this policy; use of insight/oversight; use of IV&V and other trusted verifications (e.g., independent assessments and peer reviews); and risk mitigation processes, as appropriate, based on program/project consequences of failure, risk, complexity, life span, size, and cost.

m. The Assistant Administrator for Diversity and Equal Opportunity shall provide assistance, advice, and coordination to ensure compliance with equal opportunity requirements regarding the accessibility of electronic information and information technology, including software, for persons with disabilities.

n. The Associate Administrator for Program Analysis and Evaluation provides periodic analysis and special reporting on NASA's programs and projects in support of the policies in this NPD, as well as the procedural requirements in NPR 7120's series of documents.

## 6. DELEGATION OF AUTHORITY

None.

## 7. MEASUREMENT/VERIFICATION

- a. Compliance with this NPD and its associated NPRs are verified through periodic benchmarks and assessments conducted under the authority of the Office of the Chief Engineer. Results from these benchmarks and assessments are communicated to senior management who ensure corrective actions are identified, implemented, and tracked to closure. Measurement data on compliance is collected and tracked over time by the Office of the Chief Engineer.
- b. Specific responsibilities for collecting, analyzing, and reporting software engineering and releasing metrics are contained in NPR 7150.2 and NPR 2210.1.
- c. Performance measures will be implemented to assess the Agency's compliance with intellectual property rights associated with computer software acquired, distributed, or used by the Agency in accordance with Executive Order 13103, Computer Software Piracy.

## 8. CANCELLATION

- a. NPD 2820.1C, NASA Software Policy.
- b. NPD 7120.4C, Program/Project Management.
- c. NPD 8070.6C, Technical Standards.
- d. NPD 8010.2E, Use of SI (Metric) System of Measurement in NASA Programs.

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**/s/ Charles F. Bolden, Jr.**  
**Administrator**

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## ATTACHMENT A: (DEFINITIONS)

A.1 Activity - Any of the project components or research functions that are executed to deliver a product or service or provide support or insight to mature technologies.

A.2 Authoritative Data - Data that has been designated as valid for specific official program/projects. The designated data is controlled by processes.

A.3 Deviation - A documented authorization releasing a program or project from meeting a requirement before the requirement is put under configuration control at the level the requirement will be implemented.

A.4 Engineering - Work required to define, develop, realize, deploy, operate, and sustain useful and cost-effective NASA systems by engineering disciplines and scientific and other non-technical functions.

A.5 Evaluation - The continual self evaluation and independent assessment of the performance of a program or project and incorporation of the evaluation findings to ensure adequacy of planning and execution according to plans.

A.6 Formulation - The identification of how the program or project supports the Agency's strategic needs, goals, and objectives; the assessment of feasibility, technology and concepts; risk assessment, team building, development of operations concepts and acquisition strategies; establishment of high-level requirements and success criteria; the preparation of plans, budgets, and schedules essential to the success of a program or project; and the establishment of control systems to ensure performance to those plans and alignment with current Agency strategies.

A.7 Implementation - The execution of approved plans for the development and operation of the program/project, and the use of control systems to ensure performance to approved plans and continued alignment with the Agency's strategic needs, goals, and objectives.

A.8 Independent Verification and Validation - Verification and validation performed by an organization that is technically, managerially, and financially independent of the development organization (ISO/IEC 24765:2008 Systems and software engineering vocabulary).

A.9 Program - A strategic investment by a Mission Directorate or Mission Support Office that has a defined architecture and/or technical approach, requirements, funding level, and a management structure that initiates and directs one or more projects. A program defines a strategic direction that the Agency has identified as critical.

A.10 Primary Mission Objectives - Outcomes expected to be accomplished which are closely associated with the reason the mission is proposed, funded, developed, and operated. (i.e., objectives related to top level requirements or their flow down.)

A.11 Product Data Management (PDM) - The framework that enables organizations to manage and control engineering and technical information, specifically data surrounding the product's design, definition, and related engineering, manufacturing, and logistics processes and is a key element of Product Life-cycle Management (PLM). From the product perspective, PDM organizes data required for design evolution, tracks versions and configurations of evolving design concepts; and manages archived data and other product-specific information. PDM tools provide access to product structures and support interfacing and integration to other engineering data such as requirements, and to as-built and safety and mission assurance data. From the process perspective, PDM systems offer the capability to orchestrate controlled procedural events such as design reviews, approvals, product releases, and configuration audits.

A.12 Product Life-cycle Management (PLM) - A strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition data/information across the extended enterprise from concept to end of life. PLM integrates people/organizations, processes, and information. In product-dominated endeavors, PLM serves as the information backbone that extends outside the enterprise. PLM implementations may be composed of multiple elements, including foundation technologies and standards (e.g., Extensible Markup Language, visualization, collaboration, and enterprise application integration), information authoring tools (e.g., mechanical computer-aided design, electrical computer-aided design, and technical publishing), core functions (e.g., data



vaults, document and content management, work flow and program management), functional applications (e.g., configuration management), and business solutions built on the other elements.

A.13 Product Structure - A hierarchical view of the relationship of products and component products.

A.14 Project - A specific investment having defined goals, objectives, requirements, life-cycle cost, a beginning, and an end. A project yields new or revised products or services that directly address NASA's strategic needs. They may be performed wholly in-house; by Government, industry, academia partnerships; or through contracts with private industry.

A.15 Reconciled - A reconciled life-cycle cost estimate is the Independent Cost Estimate after the independent estimators and the project staff has thoroughly reviewed respective estimates and understands the differences.

A.16 Software - Computer programs, procedures, rules, and associated documentation and data pertaining to the development and operation of a computer system. Software also includes COTS, GOTS, MOTS, embedded software, reuse, heritage, legacy, auto generated code, firmware, and open source software components. *Note 1: Only for purposes of the NASA Software Release program, the term "software," as re-defined in NPR 2210.1 does not include computer databases or software documentation. Note 2: Definitions for the terms COTS, GOTS, heritage software, MOTS, legacy software, software reuse, and classes of software are provided in NPR 7150.2.*

A.17 Waiver - A documented authorization releasing a program or project from meeting a requirement after the requirement is put under configuration control at the level the requirement will be implemented.

## **ATTACHMENT B: (ACRONYMS)**

COTS - Commercial off-the-shelf software

GOTS - Government off-the-shelf software

IT - Information Technology

IPP - Innovative Partnership Program

IV&V - Independent Verification and Validation

MOTS - Modified off-the-shelf software

NESC - NASA Engineering and Safety Center

PDM - Product Data Management

PLM - Product Life-cycle Management

R&T - Research & Technology

SI - Systeme Internationale

SRA - Software Release Authority

SRAWG - Software Release Authority Working Group

SWG - Software Working Group

VCS - Voluntary consensus standards

## **ATTACHMENT C: (REFERENCES)**

NPD 1280.1, NASA Management Systems Policy.

NPR 1440.6, NASA Records Management.

NPD 2081.1, Nondiscrimination in Federally Assisted and Conducted Programs of NASA  
- Delegation of Authority.

NPD 2091.1, Inventions Made by Government Employees.

NPD 2110.1, Foreign Access to NASA Technology Transfer Materials.

NPD 2190.1, NASA Export Control Program.

NPD 2810.1, NASA Information Security Policy.

NPD 7500.2, NASA Technology Commercialization Policy.

NPR 1441.1, NASA Records Retention Schedules.

NPR 2190.1, NASA Export Control Program.

NPR 2810.1, Security of Information Technology.

NPR 7500.1, NASA Technology Commercialization Process.

NPR 8705.2, Human-Rating Requirements for Space Systems.

NASA-STD-8739.8, NASA Software Assurance Standard.

NASA/SP-2007-6105, NASA Systems Engineering Handbook (on the Web at [http://nen.nasa.gov/nasa\\_nas/ops/systems\\_community/NASA\\_SP-2007-6105\\_Rev\\_1\\_Final\\_31Dec2007.pdf](http://nen.nasa.gov/nasa_nas/ops/systems_community/NASA_SP-2007-6105_Rev_1_Final_31Dec2007.pdf) NASA Program/Project Online Library and Resource Information System (on the Web at <https://polaris.nasa.gov/> ) NASA Engineering Network (on the Web at <http://nen.nasa.gov/>)

## **ATTACHMENT D: (DOCUMENT TREE)**

The latest version of the Documentation Tree graphic is available on the Web at [http://nen.nasa.gov/nenfileupload/files/7120.4c\\_Hierarchy.pdf](http://nen.nasa.gov/nenfileupload/files/7120.4c_Hierarchy.pdf)

### **(URL for Graphic)**

None.

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